

improvements, Norsworthy not surprisingly finds his hypothesized negative relationship. In the remaining one of 7 most-biased regressions (satisfaction of small business customers) and in all three others in the list of ten (on-time residential service calls, on-time business service calls, and on-time access service calls) Norsworthy finds a positive relationship. The effect of specification bias is evident.

Norsworthy's regression analysis also suffers from another source of specification bias. In his verbal discussion motivating his statistical tests, Norsworthy posits that reductions in service quality enhance LEC efficiency and profitability:

This criticism of the USTA model is based on the results of an earlier investigation...which found evidence suggesting that large LECs trade off efficiency, measured by TFP or gross profitability, against the quality of services provided to telephone customers...If anything, the incentives are stronger now for the LECs to reduce service quality in exchange for profitability.⁴⁹

Norsworthy effectively is hypothesizing that TFP and profitability are functions of service quality. By allegedly manipulating service quality, the LECs can affect their TFP and profitability. In contrast, the regressions he develops model service quality (the dependent variables) as a function of TFP (proxied through independent variables). There most certainly is a simultaneity bias in Norsworthy's analysis. Stated more simply, Norsworthy's motivating language and his statistical tests are addressing two very different questions. His hypothesis (p. 63) and his tests (pp. 65-66) assert opposite directions of causality.

The only additional statistical comment that can be made given the sparse results Norsworthy reports is that the adjusted R-squared statistics (measures of the total variation in service quality explained by all the variables included

⁴⁹ Ibid., p. 63.

in Norsworthy's models) are less than .16 in three of the four models for which he claims to have found a significant negative relationship between efficiency and service quality. The variables Norsworthy included in the regression models for transmission quality, large business customer satisfaction, and dial tone response time collectively explain only 15.2%, 1.4%, and 1.3%, respectively, of the total variation in these three dimensions of service quality.⁵⁰ Norsworthy's models do not seem to have captured the critical factors determining service quality. This together with the other specification biases discussed above makes it imperative that no weight be placed on Norsworthy's "findings."

3. Policy Issues

H. Issue 3a: The Moving-Average Process

AT&T, in the main document to its filing, argues against adoption of any moving average: "First, by design, moving averages are likely to be consistently inaccurate for the year in which the average actually forms the basis for the X-Factor."⁵¹ Assume, for sake of argument, that AT&T's concern is valid. As TFP growth varies, the 'X' factor set by the moving-average process will not exactly equal the "true" 'X' in each year. The fundamental flaw in AT&T's argument is that, even under the multiple 'X' option it proposes, the 'X' factors would be based on an historical average and would not be changed for at least the three-year period AT&T suggests between formal reviews. If TFP growth in any year of the three-year period differs from average TFP growth in the historical period over which AT&T

⁵⁰ *Ibid.*, p. 66.

⁵¹ Comment of AT&T, p. 33.

calculates 'X', its 'X' will be "inaccurate" relative to true TFP growth. The only way to address AT&T's concern is to annually repeg each LEC's 'X' factor based on perfect foresight of each LEC's expected TFP performance in the coming year. Short of this paradigm, any price-cap model would be subject to AT&T's criticism, including its own model. However, the disincentive problems associated with instantaneous realignment of 'X' factors based on a LEC's performance are well-understood. The 'X' factors must be beyond the firms' control.

AT&T's true concern seems to be that LEC TFP will forever continue to increase so that "under those circumstances, the moving average 'X' factors will systematically understate a LEC's productivity growth."⁵² The concern is that a moving-average process will generate 'X' factors that always lag behind the LECs' true performance. For this to be true, LEC TFP growth must always increase, a condition that not only has not been true in the past but also is not guaranteed by any industry or regulatory characteristic. When TFP growth ultimately falls below the target 'X', the moving average 'X' factor will exceed the LECs' actual performance. Of course, this is all by design and is wholly consistent with the incentive-inducing nature of price-cap regulation.

The principal problem with the AT&T discussion of moving averages is that it appears that AT&T does not appreciate the incentive structure of a price-cap regime. Footnote 23 on p. 33 states "During a period of declining productivity growth, the 'X' factor would become smaller, providing less and less challenging productivity targets for the LECs."⁵³ A moving-average model (any moving-average model) does not warrant AT&T's concern. As TFP declines, the moving average 'X' will fall but not by as much as the

⁵² *Ibid.*

⁵³ *Ibid.*, pp. 33-34.

decline in the LECs' actual TFP--thereby providing the LECs with plenty of incentive to spur their efficiency. In fact, even this is an understatement. Under declining TFP growth and a moving-average 'X' factor, the LECs would incur continuing losses until they reversed the trend in their TFP growth.

Interestingly, AT&T's concern is relevant if and only each LEC's 'X' factor is instantaneously adjusted each year. In this case, the new 'X' would simply codify the LEC's actual prior year performance and not fulfill its role as an incentive mechanism. Footnote 23 therefore attacks short-term review and LEC-specific realignment of 'X' factors, not the use of a moving average.

The necessary analysis of footnote 23 does not end here. The text in the footnote reveals an amazing lack of symmetry.

During a period of declining productivity growth, the 'X' factor would become smaller, providing less and less challenging productivity targets for the LECs. Then, as soon as productivity began to increase, the 'X' factor would be at its lowest point, thus permitting an unwarranted windfall for the LECs. Thus, the moving average procedure would consistently thwart the goals of price cap regulation: whenever the LECs actually achieve increasing levels of productivity growth, the moving average is guaranteed to eliminate or delay the rewards to ratepayers produced by those productivity gains.⁵⁴

Though AT&T incorrectly argues that during periods of TFP decline LECs would have insufficient incentive to be efficient, AT&T fails to put forward the symmetric argument that in periods of TFP increases LECs somehow would have increasing incentives to be efficient. Similarly, though the footnote argues that once TFP bottoms out and begins to increase LECs will enjoy windfall gains and ratepayers will not share those benefits (an incorrect conclusion under a moving average), there is no discussion of what for AT&T must be the perfectly symmetric occurrence in the instance of

⁵⁴ Ibid.

declining TFP rates--LECs would suffer losses and ratepayers would not share in that burden. The asymmetry in AT&T's argument is remarkable and demonstrates the author's lack of understanding of the objectives and design mechanisms of incentive regulation.

The main AT&T argument continues with the statement that, under a moving-average regime, LECs would have incentives "to engage in inefficient investment and other cost-increasing tactics designed to reduce short-run productivity measures."⁵⁵ Under the USTA 5-year moving average (after a two-year lag), a LEC would have absolutely no incentive to consciously (strategically) introduce cost increases for the purpose of reducing its TFP and therefore future 'X'. First, as proposed by BellSouth, the 'X' to which the moving average will be applied is not LEC specific but a single industry 'X'. Any individual LEC's TFP performance has only a modest effect on the industry 'X'. Second, under the USTA proposed moving-average, any inefficiency consciously or unconsciously introduced today will be offset only partially after a two-year lag by a reduced 'X' in years three through seven. A conscious decision to be inefficient therefore would be irrational. Under a moving average, each and every LEC would have every incentive to spur innovation in order both to increase its return and to share it with ratepayers over the course of the moving-average period. Once again, the AT&T arguments actually support rather than refute the moving-average model.

Three virtues of the moving-average process conspicuously left unmentioned by AT&T are (i) its reduced administrative burden (reduced need for FCC review and 'X' realignments), (ii) its elimination of any need for the consumer productivity dividend, and (iii) its replacement of sharing.

⁵⁵ *Ibid.*, p. 34.

Ratepayers automatically share in improved TFP performance as the moving average automatically adjusts 'X' over time.

I. Issue 2c: The Consumer Productivity Dividend

The AT&T position is that "the Commission should retain the Consumer Productivity Dividend of 0.5 percent."⁵⁶ Other than the fact that the status quo model incorporates a 0.5% CPD, the 0.5% dividend amount in the AT&T document appears out of nowhere. What is the basis for 0.5% instead of 0.2%? What is the basis for continuously and therefore cumulatively adding 0.5% CPDs year after year? None is presented by AT&T and Norsworthy offers none as well: "I believe it is advisable to retain the modest CPD (0.5 percent) that now exists."⁵⁷ In stark contrast, one virtue of the moving-average regime is that it eliminates the need to peg a particular CPD number and makes the CPD redundant by automatically passing through to ratepayers any efficiency gains resulting from the LECs' true TFP performance. There is no need to guess at any "CPD" number.

J. Issue 5a: Sharing

Embarking on the price-cap venture in 1991 was a novel exercise. Sharing, even with its recognized efficiency-reducing incentives, was judged by the Commission to be necessary to protect ratepayers against specification errors in the price-cap formula. However, the collective price-cap experience of the Commission, the LECs, the interexchange carriers, and end-user groups over the past five years and the significant attention now being paid by all parties to each issue raised in the various iterations of the FNPRM make it

⁵⁶ *Ibid.*, p. 35.

⁵⁷ Statement of John R. Norsworthy, Appendix A to AT&T filing, p. 29.

highly unlikely that any significant misspecifications will enter whatever price-cap formulation the Commission adopts. Will the ultimately selected specification be perfect? Undoubtedly not, but any errors are (a) likely to be small and (b) not necessarily biased in any particular direction.

The important point is that the cost-benefit test has shifted. Whereas in 1990 uncertainty over various modeling issues outweighed any efficiency-reducing effects of sharing, it is now likely the case that residual imperfections are less important than the efficiency losses resulting from sharing.

Most parties recognize the reduced efficiency incentives under any form of sharing. The Commission itself has recognized the need to eliminate sharing, in part because of the reduction in efficiency incentives that results. In its own Price Cap Review Order, the Commission found that eliminating sharing would increase efficiency by no less than 17 percent for all LECs and by approximately 41 percent for LECs under 50/50 sharing.⁵⁸ Even ETI acknowledges that sharing attenuates efficiency incentives.⁵⁹

The incentive problem is clear. Most analysts of the price-cap paradigm recognize the need to have the ultimately selected 'X' factor be beyond the LECs' control. Otherwise, well-understood strategic behavior and efficiency disincentives begin to surface. The same logic applies to sharing. The extent of mandated sharing (at least under the current interim price-cap order) depends on each LEC's rate of return and therefore is, at least partially, within each LEC's control. The efficiency disincentive becomes operative. As a LEC increases its productivity and therefore its earnings, it may trigger its movement to a higher sharing category. In this instance, taxing the LEC's earnings based on its measured rate of return is equivalent to taxing the LEC's

⁵⁸ Price Cap Review Order, Paragraph 188.

⁵⁹ ETI Statement, p. 64.

productivity performance above some 'X' threshold. The usual disincentive problems take hold.

The bad news is that sharing reduces LEC incentives to maximize productivity growth. The good news is that the moving average proposed by USTA addresses the concerns of those calling for continued reliance on sharing. For example, ETI is concerned that "nothing in the price cap mechanism imposes any duty on the part of LECs to reduce symmetrically rates if earnings grow to excessive levels."⁶⁰ A moving average, by definition, addresses this concern directly without diminishing productivity incentives. As earnings rise with higher productivity, a moving average directly translates this into a higher 'X', thereby guaranteeing the flow-through of productivity gains to ratepayers.

Another concern expressed in the ETI report is that LECs choosing high 'X' factors under the Commission's interim paradigm will never share: "LECs that anticipate above-average performance and productivity growth will elect the highest 'X' factor, but will thereby escape any further sharing obligation."⁶¹ The proper response is twofold. First, under the present interim paradigm ratepayers are already advantaged by the high 'X' and its guarantee of a lower cap on rates. The LECs choosing high 'X' factors bear all the risk of not achieving these high 'X' levels. Second, and more importantly, USTA's moving-average process assures that any superlative performance achieved by the LECs will be passed through to ratepayers because of the adjustments to 'X' guaranteed by the moving-average process.

One of the most important features of a moving average calculated on an industry-wide basis is that it has none of the productivity disincentive

⁶⁰ *Ibid.*, p. 62.

⁶¹ *Ibid.*, p. 65.

problems associated with sharing. Under a moving average, each LEC has the unambiguous incentive to maximize its productivity growth. Under sharing, the incentive to increase productivity is reduced because added productivity growth will increase earnings which in whole or in part will be taxed away.

Admittedly, not all potential misspecifications can be removed from the ultimately selected price-cap formula but, as discussed above, any residual imperfections reasonably can be expected to be small and not necessarily biased in any one particular direction. Moreover, improved efficiency incentives resulting from the elimination of sharing will likely offset (and perhaps exceed) any adverse effect of remaining misspecification problems.

This, of course, begs the question: If (a) sharing reduces efficiency incentives and therefore contradicts the very objective of incentive regulation and (b) its elimination satisfies the cost-benefit test of balancing ratepayer interests with efficiency gains, why is sharing still raising its ugly head? The answer is that the only remaining role for sharing is as an incentive mechanism for LECs to choose the highest 'X' factor (the factor with no sharing) in a multiple 'X' paradigm. The residual case for sharing hinges totally on the case for multiple v. single 'X' price-cap models.

K. Issue 4: Superiority of a Single Industry X

Early in its main cover document to its Fourth FNPRM filing with the Commission AT&T states "Although a single 'X' factor would most closely replicate conditions the LECs would face in a competitive market..."⁶² Though AT&T ultimately argues that LECs should be allowed to choose one from two 'X' factor options, AT&T recognizes that a single 'X' factor best mimics a competitive marketplace--the true objective of any price cap plan.

⁶² Comment of AT&T, p. 5

This view is wholly consistent with USTA's position and the conclusion reached in my statement appended to the BellSouth filing submitted in this Docket in January 1996. A single industry-wide 'X' factor modified annually through a moving-average process is the only price cap paradigm that induces each LEC to maximize its productivity growth, eliminates any potential incentive for any LEC to engage in strategic behavior, eliminates the need for sharing and the consumer productivity dividend, and best prepares the LECs for life in a competitive Darwinian environment.⁶³

Consider the benefits of a single 'X' over a multiple 'X' regime.

1. Sharing can be eliminated since the original objectives of sharing are accomplished through the moving-average process.
2. The moving-average process replaces the need for both sharing and the CPD.
3. Opportunities for LECs to annually shift from one 'X' factor to another, characterized as "gamesmanship" in both Norsworthy and ETI statements, definitionally disappear. The moving-average process eliminates any incentive to shift expenses across accounting periods.
4. Only a single 'X' paradigm mimics the competitive world the LECs have already entered. Though its expected term can be debated, price-cap regulation is a transition device. The Commission has the opportunity to allow the LECs to experience more accurately the rigors of a competitive environment without sacrificing its responsibilities to ratepayers during this transition period.

L. The AT&T Proposal: Returning to Rate of Return

Viewing the AT&T proposal in its entirety leads to the inescapable conclusion that AT&T is recommending that the Commission effectively return to a rate-of-return regime for LEC regulation. Consider the following features of the AT&T proposal.

⁶³ A provision for "above-cap" filings could be maintained to evaluate undue hardship claims by individual LECs.

1. The Performance-Based Model requires that all profits be assigned to the cost of capital and thereby necessarily maintains that revenues equal costs, the initial condition and the guiding principle for the derivation of the rate-of-return formula.
2. Norsworthy characterizes regulatory mandates as one basis for his TFP model's requirement that total revenues exactly equal total costs: "Why should total revenues exactly equal the total costs assigned to the inputs? There are two reasons: in principle, the economic theory of production requires it, and in practice, the regulatory authorities mandate it."⁶⁴ This "regulatory mandate" holds only for rate-of-return regulation. It is inconsistent with price-cap regulation.
3. AT&T's recommends that sharing be retained. Sharing is the umbilical cord of rate-of-return regulation.
4. AT&T's plea that "the Commission should conduct annual performance reviews...and a major LEC performance review every three years"⁶⁵ is nothing more than an attempt to preserve rate-of-return review.
5. Norsworthy proposes revenue requirements as weights for forming a measure of LEC output. To operationalize Norsworthy's proposal, arbitrary cost-allocation rules intertwined with rate-of-return regulation would have to be maintained.
6. The only possible way to avoid AT&T's concern that "moving averages are likely to be consistently inaccurate for the year in which the average actually forms the basis for the 'X' factor"⁶⁶ is to have annual hearings to repeg each LEC's 'X' factor to its expected TFP performance in the coming year. This mimics perfectly the rate-of return process and could not be more at odds with any form of incentive regulation.

The true objective of the AT&T proposal is transparent: return the LECs to rate-of-return regulation. History, the marketplace, and the Commission have already rejected this paradigm.

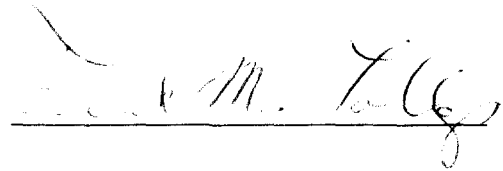
⁶⁴ Statement of John R. Norsworthy, Appendix A to AT&T filing, p. 37.

⁶⁵ Comment of AT&T, p. v.

⁶⁶ Comment of AT&T, p. 33.

4. Conclusion

Productivity growth unambiguously is welfare improving. Combining this with the fact that a single industry 'X' maximizes the LECs' incentive to increase productivity growth, the Commission should embrace the current opportunity to reject multiple 'X' factors, eliminate sharing and the consumer productivity dividend, and establish a single industry 'X' based on a moving average. After all, a competitive market treats all firms as if each faced the same 'X' factor. The LECs may as well get accustomed to the Darwinian principles of a competitive marketplace.

A handwritten signature in dark ink, appearing to read "Frank M. Gollop", written over a horizontal line.

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